IJRAME

INTERNATIONAL JOURNAL OF RESEARCH IN AERONAUTICAL AND MECHANICAL ENGINEERING
WWW.IJRAME.COM
ISSN (ONLINE): 2321-3051

Vol.9 Issue 04,
April 2021
Pg: -32-38

A REVIEW OF COMPOSITE MATERIALS: HISTORY, TYPES, ADVANTAGES, AND APPLICATIONS OVER TRADITIONAL MATERIALS

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ABSTRACT

Today composite materials have changed all the material engineering. The evolution of composite materials have given an opportunity to various designers to use new and better materials resulting in cost reduction, increase in efficiency and better utilization of available resources. Composite materials have played an important role throughout human history, from housing early civilizations to enabling future innovations. Composites offer many benefits such as the key among them are corrosion resistance, design flexibility, durability, light weigh, and strength. Composite have their own applications in daily lives such as products that are used in constructions, medical applications, oil and gas, transportation, sports, aerospace industries, automobile sector, manufacturing industries and many more. This paper presents the general review of composite material, overview of history of composite materials in conducted, demonstrate the advantages of the composites over the conventional materials, and also future demand of composite materials towards industrial environment.

Keywords: Composite materials, Automobile sectors, Aerospace industries, Manufacturing Industries.

INTRODUCTION

A composite can define as “Two inherently different materials that when combine together produce a material with properties that exceed the constituent materials”. In other words Composite material can be defined as a combination of a matrix and a reinforcement, which when combined gives properties superior to the properties of the individual components. The reinforcement fibers can be cut, aligned, placed in different ways to affect the properties of the resulting composite. The matrix, normally a form of resin, keeps the reinforcement in the desired orientation. It protects the reinforcement from chemical and environmental attack, and it bonds the reinforcement so that applied loads can be effectively transferred. A typical composite material is a system of materials composing of two or more materials (mixed and bonded)

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on a macroscopic scale. For example, concrete is made up of cement, sand, stones, and water. Composite materials have been using for thousands of years, e.g. they have manufactured bricks with the help of mud which is thousand year-old technology. Now days, we all depend on composite materials at some aspects of our lives. Composite material defined as a mixture of two or more than two materials (reinforcement, fillers and binder) different in composition. Composite materials also called composition materials or shortened to composites. Composite materials are materials made from two or more than two materials with considerably differ in physical and chemical properties, that when combined, make a material with appearances different from the individual components. Composites comprise strong load carrying material is known as reinforcement and weaker materials is known as matrix. Reinforcement provides stiffness and strength which helps to support structural load. Composite materials do not lose their respective identities but still relate their properties to the product causing from their mixture. The term composite could mean almost anything if taken at face value, since all materials are composed of dissimilar subunits if examined at close enough detail. But in modern materials engineering, the term usually refers to a “matrix” material that is reinforced with fibres. For instance, the term “FRP" (Fiber Reinforced Plastic) usually indicates a thermosetting polyester matrix containing glass fibres, and this particular composite has the lion's share of today's commercial market.

LITERATURE REVIEW

1. M.K. Sai [1] discussed a wide range of chemical agents including acid and salt spray. The ability to deform and spring back their original shape without drawback.
2. Rahul Redy Nagawally [4] elobrated may desirable properties and make them the best material that can be used in many applications. The properties make the composite materials replace the already existing material which is used in the present days.
3. Gourav Gupta [5] discussed about the composite material have great potentiality of application in structures subjected primarily to compressive loads.
4. Przemylaw D.Pastuszak [9] discussed about the perspective view of possible application in structural elements subjected to thermal loads and heat resistance.
5. G.V.Mahajan [12] discussed to composite have attractive mechanical and physical properties that are now being utilized in automotive industry and aerospace on a grand scale worldwide.

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6. Kumar S. et al [13] discussed industrial and domestic application of rice husk and rice husk ash. Due to fine insulating properties of rice husk like low thermal conductivity, low weight, high melting point, low bulk density high porosity, it used for the production of high quality steel. Blended cement is produced by using rice husk ash for fulfilling the increasing need for building material. Due to large silica content in rice husk ash, extraction of silica is economical. Silica are used in rubber industries as a reinforcing agent, in cosmetics, in toothpastes, in food industries as an anticaking agent.
7. T. Subash et al [14] discussed about bast fibers reinforced green composites for aircraft indoor structures applications. These materials provides the benefits in making of the body panels such as in seat cushions, cabin linings, parcel shelves etc., The natural fibers such as jute, kenaf, bagasse, bamboo, coir, sisal have proved to be a materials with the high strength in aerospace and automotive industry. These composites show a lower density as compared to traditional mineral composites and have a great potential to make lightweight sustainable finished products that can reduce tremendous amount of energy consumption in the aerospace industry.

APPLICATIONS OF COMPOSITE MATERIAL:

Composite materials are used in the following fields:

1. **Aerospace structure:**

   The primary benefits that composite components are reduced weight and assembly simplifications. It is used in aircraft structures such as spoilers, air brakes, elevators, engine cowlings, rear bulk head, die electric panels, doors, ring rips, ducts and fair rings. The materials used for wall construction such as E-glass roving's and epoxy resin because of their good electrical and mechanical properties. The major uses of composites are used in development of helicopters, small and big civil transport, and military fight aircraft.

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2. **Automobile and Transport Industries:**

Increasing the fuel economy by reducing the vehicles weight has stimulated tremendous interest for composite materials in automobile and transport industry. Friction is involved in automobile parts, due to which using graphite dispersed aluminium composites.

The following industries are introduced/used composite material:

- Commercial vehicles (Cabs and trucks)
- Car bodies
- Sporting cars
- Buses
- Ambulance
- Car vans

The following components are made up by composite materials:

- Seat
- Roof
- Instrument cluster
- Wheels
- Leaf spring
- Exterior panel
- Steering wheel
- Dash board

3. **Marine Industries:**

Composite materials are used in the following composites:

- Engine covers
- Personal water craft
- Board access covers
- Electrical buyers
- Motor housing

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4. **Electrical Distribution:**

   Composite materials are used in the following composites:

   - Circuit breakers
   - Motor control
   - Centres
   - Generators
   - Switch gears
   - Busway
   - Control cabinets
   - Cross arms

5. **Energy:**

   Composite materials are used in the following composites:

   - Wind turbine
   - Fuel cells
   - Solar panels
   - Pumps

6. **Biomedicine:**

   Composite materials are used in the following composites:

   - Artificial teeth
   - Artificial parts of the skeletal system
   - Artificial heart valve

7. **Environmental Engineering:**

   Device and systems destined to use in extreme condition, boilers for water treatment.

CONCLUSION

Composite materials have attractive mechanical and physical properties. Composite materials have a great potentiality of applications in the various fields such as Aerospace, appliances/business, architecture, automotive and transportation, construction and infrastructure, corrosive environment, electrical, energy,

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marine, sports and recreations. So, the mentioned field of applications clearly indicating that the importance of the composite materials than the common materials.

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